

Notice of Allowability

Application No.

10/523,611

Examiner

Michael Bernshteyn

Applicant(s)

YAMAGO ET AL.

Art Unit

1713

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 05/23/2007.
2. ☒ The allowed claim(s) is/are 1-6 and 13-27.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some* c) ☐ None of the:
- ☒ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|--|---|
| 1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Notice of Informal Patent Application |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 6. <input type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date _____ |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____ | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| | 9. <input type="checkbox"/> Other _____ |

Michael M. Bernshteyn
Patent Examiner
Art Unit 1713

DETAILED ACTION

1. This Office Action is a response to the remarks filed on May 23, 2007. No claims have been amended, cancelled or added.
2. In view of the remarks and the Declaration submitted by the Applicants, the rejection under 35 U.S.C. 103(a) of claims 1-6 and 13-27 as being unpatentable over Yamago et al. in view of Goto et al. has been withdrawn.
3. Claims 1-6 and 13-27 are now active.

EXAMINER'S AMENDMENT

4. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Michael R. Davis on July 30, 2007.

5. Claims 7-12 have been cancelled
6. Claim 1 has been amended as follows:
Line 4: after the word "and" insert the words "in the presence of".
7. Claim 6 has been amended as follows:
Line 3: after the word "and" insert the words "with use of".

Allowable Subject Matter

8. Claims 1-6 and 13-27 are allowed.
9. The following is a statement of reasons for the indication of allowable subject matter: the present claims are allowable over the closest reference: Yamago et al. ("Organotellurium Compound as Novel Initiators for Controlled/Living radical Polymerizations. Synthesis of Functionalized Polystyrenes and End-Group Modifications", Journal of the American Chemical Society, 124 (12), 2874-2875, 2002.02.27).

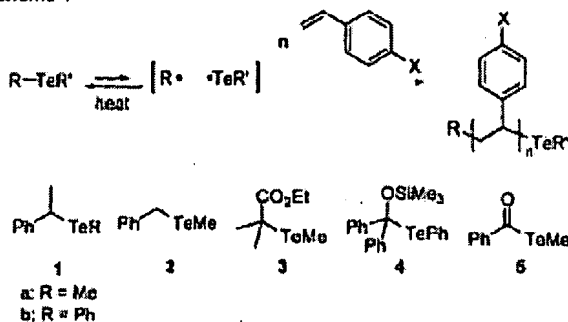
With regard to the limitation of claims 1-6 and 13-27, Yamago discloses the advantages of organotellurium compound compounds over nitroxides, e.g., more facile synthesis of tailor-made initiators and easy of polymer-end group modifications, would be highly useful in the synthesis and synthetic transformations of these compounds.

Yamago discloses several new organotellurium-based initiators for controlled/living radical polymerization of styrene derivatives that allows accurate weight control with defined end-groups, which can be transformed into a variety of end-group modified polystyrenes (page 2874, 1st column, 2nd paragraph).

Yamago discloses bulk polymerization of styrene (X=H) with the polymeric-end mimetic initiator 1a (R=Me) initiated the polymerization efficiently, and afforded polystyrene with the predicted molecular weight and low polydispersity ($M_n = 9200$, PD = 1.17) in 96% yield (Table 1, entry 1).

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Scheme 1

Table 1. Effects of Initiators for Polymerization of Styrene^a

entry	X	initiator	conversion (%)	M_n^b	PD ^c	BDE (kJ/mol) ^d
1	H	1a	96	9 200	1.17	123
2	H	1b	91	15 900	1.45	112
3	H	2	89	9 000	1.46	142
4	H	3	79	9 000	1.15	114
5	H	4	76	50 700	1.80	25
6	H	5	83	25 400	1.58	182
7 ^e	H	1a	78	35 700	1.21	
8 ^f	H	1a	84	62 600	1.30	
9	Cl	1a	88 ^g	8 800	1.41	
10	OMe	1a	94 ^h	10 900	1.17	

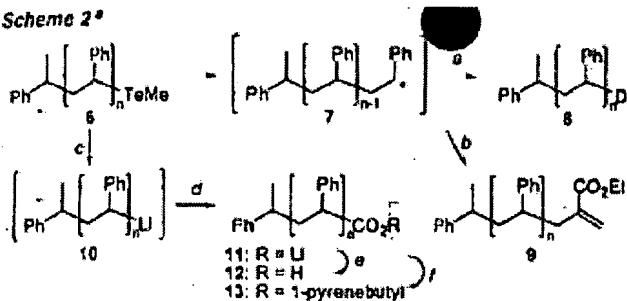
^a Bulk polymerization was carried out with 100 equiv of styrene at 105 °C for 16–18 h under a nitrogen atmosphere. ^b Molecular weight (M_n) and polydispersity (PD) were calibrated by size exclusion chromatography using polystyrene standards for samples after single precipitation from MeOH. ^c Bond dissociation energy of the initiator obtained by B3LYP DFT calculations with the LANL2DZ basis set for tellurium atom and the 6-31G(d) basis set for the rest. ^d The reaction was carried with 500 equiv of styrene. ^e The reaction was carried out with 1000 equiv of styrene. ^f The reaction was carried out at 100 °C for 17 h. ^g The reaction was carried out at 100 °C for 36 h.

It is noted that the organotellurium compounds of the above formulas 1a, 1b, 2 are substantially identical to the claimed formula (1).

The initiators 1a and 3 promoted polymerization under much milder conditions. Molecular weight increased linearly with increase of styrene, and the products were obtained with low polydispersity (entries 7 and 8).

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Scheme 2*



* AIBN (0.1 equiv), Bu_3SnD (3 equiv), $\text{C}_6\text{H}_5\text{CF}_3$, 80 °C, 4 h. ^b AIBN (0.1 equiv), ethyl tributylstannylmethacrylate (4 equiv), $\text{C}_6\text{H}_5\text{CF}_3$, 80 °C, 6 h. ^c BuLi (1.5 equiv), THF, -72 °C, 3 min. ^d CO_2 (excess). ^e Aqueous HCl (excess). ^f 2,4,6- $\text{Cl}_3\text{C}_6\text{H}_2\text{COCl}$ (2 equiv), Et_3N (2 equiv), THF, room temperature, 1.5 h, then 1-pyrenebutanol (4 equiv), DMAP (4 equiv), CH_2Cl_2 , room temperature, 3 h.

The "living" nature of the current polymerization was ascertained by several control experiments. First, the molecular weight (M_n) increased linearly with an increase in the amount of styrene used. Second, the molecular weight also increased linearly with an increase of the conversion of styrene. Third, a block copolymer was formed by the treatment of starting polystyrene block prepared from 1a and 100 equiv of styrene with 4-methoxystyrene (100 equiv). Finally, the high level of fidelity of the end-group was confirmed by labeling experiments (page 2875, 1st column, 1st paragraph).

10. However, Yamago does not disclose or fairly suggest the instantly claimed process for producing a living radical polymer, which comprises polymerizing a vinyl monomer in the presence of a living radical polymerization initiator represented by the compound of formula (1) in the presence of the compound of formula (2) as per instant claim 1.

11. As of the date of this Notice of Allowability, the Examiner has not located or identified any reference that can be used singularly or in combination with another

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reference including Yamago et al. to render the present invention anticipated or obvious to one of ordinary skill in the art.

12. In the light of the above discussion, it is evident as to why the present claims are patentable over the prior art.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delay, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reason for Allowance".

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Bernshteyn whose telephone number is 571-272-2411. The examiner can normally be reached on M-F 8-5:30.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on 571-272-1114. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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MB
07/30/2007


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